

REMARKS

Entry of this Amendment Under 37 C.F.R. 1.116 is respectfully requested because it addresses issues raised by the Examiner in a prior Office Action, thereby placing the application into allowance or better form for consideration upon appeal. No new matter is believed to be added to the application by this Amendment.

Status of the Claims

Claims 1, 5-8 and 10-20 are pending in the application. The amendments to claim 1 incorporate subject matter canceled from claim 17 and find additional support at page 11 of the specification. The amendments to claims 7, 8, 10, 11, 14 and 17 adjust the dependencies, improve antecedent basis and cancel redundant subject matter.

Rejection Under 35 U.S.C. 103(a) over Shinozuka, JP '789 and Nonoyama, (Paragraphs 2-4 of the Office Action)

Claims 1, 5-8, 10-13, 18 and 20 are rejected under 35 U.S.C. 103(a) as being obvious over Shinozuka (U.S. Patent 5,298,305) in view of JP '789 (JP 09098789) and further in view of Nonoyama (U.S. Patent No. 5,646,924). Applicants traverse this rejection and respectfully request reconsideration and withdrawal thereof.

**The Present Invention and Its Advantages**

The present invention pertains to an information recording medium which retards the diffusion of sulfur so as to prevent deterioration of the properties of the recording medium. As set forth in claim 1, the information recording medium has a substrate, a first dielectric protective film over the substrate, an interface film over the first protective film, at least one recording film over the interface film and a second dielectric protective film over and in contact with the recording film. The recording film undergoes change in atomic arrangement upon irradiation with recording beams. Also the recording film is not in contact with the first protective film.

In the invention, the second protective film contains a sulfide, and a nitrogen content of the second protective film is not more than 25 at.%. The recording film contains Ge-Sb-Te base material and 0.1-10 at.% of at least one element selected from the group consisting of Si, P, V, Mn, Fe, Co, Ni, Cu, Zn, Nb, Mo, Ru, Rh, Pd, Ag, Cd, Sn, Ta, Os, Ir, Pt, Au, Tl, Pb, Bi and Cr. Also, the nitrogen content at both sides of an interface at which the recording film and the second protective film contact each other is such that the nitrogen content of the protective film side is greater than that of the recording film side, and the changing amount of the nitrogen content in the direction of thickness of the

film with the interface between the films as a boundary is 1-50 at.%/nm.

**Distinctions of the Invention over Shinozuka, JP '789 and Nonoyama**

Shinozuka pertains to a phase change-type information recording medium that has a substrate 1, a protective layer 2, a recording layer 3 and a protective layer 4, consecutively. See Fig. 1 of Shinozuka. The abstract of Shinozuka discusses an Ag-containing recording layer of a material of the general formula:



where  $\alpha + \beta + \gamma + \delta + x = 100$  and M can be B, N, C, P or Si.

Shinozuka fails to disclose nitrogen content on both sides of the recording and protecting layers (as is acknowledged by the Examiner), and the changing amount of nitrogen content. Shinozuka further fails to disclose the 1-50 at.%/nm nitrogen content, but the Examiner takes the position that this is a routine range that can be obtained by one having ordinary skill in the art. Shinozuka additionally fails to disclose protecting layers containing ZnS-SiO<sub>2</sub>.

JP '789 is used for teachings pertaining to a protective layer on one side of the recording layer, and to nitrogen content in the vicinity of the boundary and a ZnS-SiO<sub>2</sub> underlayer. The Examiner

also relies upon Nonoyama for including ZnS-SiO<sub>2</sub> in the recording media to reduce environmental influences.

Both Shinozuka and JP '789 have a recording layer that is sandwiched directly in contact with protective layers. In contrast, the present invention has a recording film that is in contact with only one of the protective films, and the bottom protective film is shielded from the recording film by an interface film.

In his Response to Arguments (paragraph 7 of the Office Action), the Examiner states "Applicant does not specifically claim that the second protective layer is not in contact with the recording layer. Applicant additionally does not claim an interface film."

However, claim 1 as instantly amended recites "an interface film over the first protective film" and additionally sets forth that "the recording film is not in contact with the first protective film". As a result, the invention as is instantly embodied in claim 1 sets forth features that are neither disclosed nor suggested by Shinozuka, JP '789, or Nonoyama. As a result, a *prima facie* case of obviousness has not been made over Shinozuka, JP '789 and Nonoyama.

Further, as is discussed at page 9 of the Amendment filed February 6, 2002, the combination of Shinozuka with JP '789 would impermissibly change the principle of operation of Shinozuka. Yet

further, as is discussed at page 10 of the Amendment filed February 6, 2002, the present invention shows unexpected results over the prior art. As a result, the present invention is patentable even if Shinozuka, JP '789 and Nonoyama could be combined to assert *prima facie* obviousness over independent claim 1. Claims dependent upon claim 1 are patentable for at least the above reasons alone.

Accordingly, this rejection is overcome and withdrawal thereof is indicated.

**Rejection Under 35 U.S.C. 103(a) over Shinozuka, JP '789, Nonoyama and Miyauchi (Paragraphs 5 and 6 of the Office Action)**

Claims 14-17 and 19 are rejected under 35 U.S.C. 103(a) as being obvious over Shinozuka, JP '789, Nonoyama and further in view Miyauchi (U.S. Patent No. 5,878,021).

Miyauchi fails to disclose the deficiencies of Shinozuka, JP '789 and Nonoyama in suggesting an embodiment of the present invention.

The Examiner turns to Miyauchi for teachings pertaining to two protective films and two protective layers. However Miyauchi fails to address the deficiencies of Shinozuka, JP '789 and Nonoyama in asserting *prima facie* obviousness over the instantly claimed invention. As a result, the combination of Shinozuka, JP '789, Nonoyama and Miyauchi are insufficient to motivate a person having ordinary skill in the art to produce an embodiment of the invention

as is claimed in any one of claims 14-17 and 19. As a result a *prima facie* case of obviousness has not been made. Accordingly, this rejection is overcome and withdrawal thereof is indicated.

**Conclusion**

The Examiner is respectfully requested to enter this Reply After Final in that it raises no new issues. Alternatively, the Examiner is respectfully requested to enter this Reply After Final in that it places the application in better form for Appeal.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

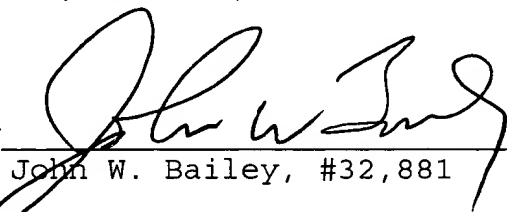
Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP


By

  
John W. Bailey, #32,881

P.O. Box 747

Falls Church, VA 22040-0747

(703) 205-8000

  
JWB/REG:jls  
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Attachment: Version with Markings to Show Changes Made

(Rev. 02/20/02)

VERSION WITH MARKINGS TO SHOW CHANGES MADEIN THE CLAIMS:

The claims have been amended as follows:

1. (Three Times Amended) [An information recording medium comprising a substrate on which at least a recording film which undergoes change in atomic arrangement upon irradiation with recording beams and a protective film comprising a dielectric are formed, said recording film and said protective film being formed in contact with each other, wherein] An information recording medium, comprising:

a substrate;

a first [dielectric protective film] over the substrate;

an interface film over the first protective film;

at least one recording film over the interface film, the recording film undergoing change in atomic arrangement upon irradiation with recording beams; and

a second dielectric protective film over and in contact with the recording film, wherein

the second protective film contains a sulfide and the nitrogen content in the second protective film is not more than 25 at.%, the recording film contains Ge-Sb-Te based material and 0.1-10 at.% of at least one element selected from the group consisting of Si, P, V, Mn, Fe, Co, Ni, Cu, Zn, Nb, Mo, Ru, Rh, Pd, Ag, Cd, Sn, Ta, Os, Ir, Pt, Au, Tl, Pb, Bi and Cr, the element bonds to sulfur to



produce sulfide or produces a barrier layer inhibiting diffusion of sulfur,

nitrogen contents on both sides of an interface at which the recording film and the second protective film contact with each other is such that the nitrogen content of the protective film side is greater than that of the recording film side and the changing amount of the nitrogen content in the direction of thickness of the film with the interface between the films as a boundary is 1-50 at.%/nm, and the recording film is not in contact with the first protective film.

7. (Twice Amended) [An] The information recording medium according to [claim 2,] claim 1, wherein the second protective film contains zinc sulfide.

8. (Twice Amended) [An] The information recording medium according to [claim 2,] claim 1, wherein the second protective film contains a mixture of zinc sulfide and silicon dioxide.

10. (Amended) The information recording medium according to claim 1, wherein the protective [film comprises] films comprise ZnS-SiO<sub>2</sub>.--

11. (Amended) The information recording medium according to claim 1, wherein the protective [film comprises] films comprise  $(\text{ZnS})_{80}(\text{SiO}_2)_{20}$ .--

14. (Amended) The information recording medium according to claim 1, which further comprises:

a first reflective layer over the [protective layer] second protective film; and

a second reflective layer over the first reflective layer.

17. (Amended) The information recording medium according to claim 1, wherein [the protective film is a first protective film, and the information recording medium further comprises a second protective film over the first protective film, and] the first protective film is thicker than the second protective film.